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Toshihisa Nozawa

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EXAMINER

DHINGRA, RAKESH KUMAR

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/787,204	<b>Applicant(s)</b> NOZAWA ET AL.	
	<b>Examiner</b> RAKESH K. DHINGRA	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 8/11/08.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 19-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 19-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2/27/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments, see pages 2-8, filed 8/11/08, with respect to the rejection(s) of claim(s) 19-30 under 35 USC 103 (a) that Wang in view of Koshimizu and Brown fail to teach claim 19 limitation "introducing, after [a] substrate is plasma-processed, a cleaning gas into [a] process chamber while the inside of said process chamber is evacuated by a second exhaust port positioned lower than [a] first exhaust port in said process chamber" have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of new references [Lee et al (US 6,857,388), Fukuda et al (US 5,449,411) and Zhao et al (US 2004/0144490)] that when combined read on claim 19 limitations. Accordingly claim, 19 and 22-24 have been rejected under 35 USC 103 (a) as explained below. Balance claims 20, 21 and 25-30 have also been rejected under 35 USC 103 (a) as explained below. Applicant's arguments regarding previously cited references of Wang, Koshimizu, Brow, and Takagi are moot in view of new grounds of rejections as explained below.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 19, 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US 6,857,388) in view of Fukuda et al (US 5,449,411) and Zhao et al (US 2004/0144490).**

Regarding Claim 19: Fukuda et al teach a method for processing a substrate comprising:  
delivering a substrate 1 to be plasma-processed into a process chamber 5;  
introducing a process gas (through process gas conduits 6, 7) into said process chamber while an inside of said process chamber is evacuated by a first exhaust port 9 in said process chamber;  
plasma-processing said substrate 1 and introducing, after said substrate is plasma-processed, a cleaning gas (through a cleaning gas conduit 8) into said process chamber 5 while the inside of said process chamber is evacuated (since chamber cleaning is performed by plasma processing) by the exhaust port in said process chamber, thereby cleaning the inside of said process chamber (e.g. Figs. 1, 2. and col. 4, line 35 to col. 6, line 40).

Fukuda et al do not teach that during cleaning the inside of said process chamber is evacuated by a second exhaust port positioned lower than said first exhaust port in said process chamber.

Lee et al teach a substrate processing apparatus comprising:  
delivering a substrate 64 to be plasma-processed into a process chamber 52;

introducing a process gas (through gas supply unit 54) into said process chamber while an inside of said process chamber is evacuated by a first exhaust port 60 in said process chamber; plasma-processing said substrate 64 and introducing after said substrate is plasma-processed a cleaning gas (like SF<sub>6</sub>) into said process chamber 52 for generating a plasma in the chamber (the inside of said process chamber would be normally evacuated during plasma processing) by a second exhaust unit 58 (since this exhaust unit is used for evacuating around the susceptor 66) that is positioned lower than said first exhaust port in said process chamber (e.g. Fig 4 and col. 5, line 40 to col. 8, line 20).

Lee et al do not teach the substrate is processed by plasma processing and also do not explicitly teach the second exhaust port is used for evacuating the inside of the process chamber during process chamber cleaning.

Fukuda et al teach a method for processing a substrate comprising:

delivering a substrate 1 to be plasma-processed into a process chamber 5;

introducing a process gas (through process gas conduits 6, 7) into said process chamber while an inside of said process chamber is evacuated by a first exhaust port 9 in said process chamber; plasma-processing said substrate 1 and introducing, after said substrate is plasma-processed, a cleaning gas (through a cleaning gas conduit 8) into said process chamber 5 while the inside of said process chamber is evacuated (since chamber cleaning is performed by plasma processing and the chamber is normally evacuated during such operation) by an exhaust port thereby cleaning the inside of said process chamber. Fukuda et al also teach that the invention improves the cleaning of chamber in the chamber portion around the substrate holder and such reaction products that adhere to the chamber wall during film deposition are removed and exhausted through exhaust port 9 disposed near a bottom wall of the process chamber (e.g. Figs. 1, 2. and col. 4, line 35 to col. 6, line 40). It would be obvious to use plasma processing for processing the substrate instead of thermal deposition as an alternate known, and exhaust

the reaction products through the second exhaust port of Lee et al in view of teaching of Fukuda et al to improve the cleaning of process chamber during cleaning process.

In this regard courts have ruled:

An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to use the second exhaust port for evacuating the process chamber during cleaning process as taught by Fukuda et al in the apparatus of Lee et al to enable effectively remove the plasma reaction products especially the chamber portion surrounding the susceptor.

Lee et al in view of Fukuda et al do not explicitly teach the inside of the process chamber is evacuated during cleaning process.

Zhao et al teach a method of cleaning a cleaning a CVD chamber 102 wherein during the cleaning operation 212 the process chamber is evacuated to exhaust the deposits that are transformed into volatile compounds by the cleaning gas (e.g. Figs. 1, 2 and para. 0052).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to evacuate the process chamber during the cleaning process as taught by Zhao et al in the apparatus of Lee et al in view of Fukuda et al to enable to exhaust the deposits that are transformed into volatile compounds by the cleaning gas.

Regarding Claim 22: Lee et al teach that inside of process chamber can be exhausted by the first and second exhaust ports 58, 60 when cleaning gas is introduced in the processing chamber (Lee et al – Fig. 4 and col. 5, lines 50-60).

Regarding Claim 23: Lee et al teach that the cleaning gas is SF<sub>6</sub> (a reactive gas) [col. 7, lines 35-40].

Regarding Claim 24: Fukuda et al teach a microwave is used during the cleaning process (col. 4, lines 35-40).

**Claims 20, 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US 6,857,388) in view of Fukuda et al (US 5,449,411) and Zhao et al (US 2004/0144490) as applied to claims 19, 22-24 and further in view of Takahashi et al (US 5,520,743).**

Regarding Claim 20: Lee et al in view of Fukuda et al and Zhao et al teach all limitations of the claim including that susceptor 66 is movable up/down and that second exhaust port 58 is positioned lower than a surface of the substrate.

Lee et al in view of Fukuda et al do not explicitly teach the first exhaust port is positioned higher than a surface of the substrate.

Takahashi teaches a substrate processing apparatus with a up/down movable substrate W and a first and second exhaust ports 32, 45 respectively, wherein the first exhaust port 32 is disposed higher than the substrate W (in its lowered position) [e.g. Fig. 1 and col. 2, line 35 to col. 4, line 30].

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide the first exhaust port positioned higher than the a surface of the substrate as taught by Takahashi in the apparatus of Lee et al in view of Fukuda et al and Zhao et al to enable entry/exit of the substrate into the processing chamber.

Regarding Claim 25: Lee et al teach that inside of process chamber can be exhausted by the first and second exhaust ports 58, 60 when cleaning gas is introduced in the processing chamber (Lee et al – Fig. 4 and col. 5, lines 50-60).

Regarding Claim 26: Lee et al teach that the cleaning gas is SF<sub>6</sub> (a reactive gas) [col. 7, lines 35-40].

Regarding Claim 27: Fukuda et al teach a microwave is used during the cleaning process (col. 4, lines 35-40).

**Claims 21, 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US 6,857,388) in view of Fukuda et al (US 5,449,411), Zhao et al (US 2004/0144490) and Takahashi et al (US 5,520,743) as applied to claims 20, 25-27 and further in view of Takagi et al (US 6,402,847).**

Regarding Claim 21: Lee et al in view of Fukuda et al, Zhao et al and Takahashi et al teach all limitations of the claim (as already explained above under claims 19, 20) including that the substrate 64 can be moved up/down along with susceptor 66 that is movable in up/down direction (Lee et al – Fig. 4 and col. 5, lines 25-40), that first exhaust port is positioned higher than substrate surface during entry/exit of substrate (Takahashi – Fig. 1), and further that second exhaust port is positioned lower than the substrate surface during cleaning (Lee et al – Fig. 4).

Lee et al in view of Fukuda et al, Zhao et al and Takahashi et al do not teach substrate is moved up during plasma processing such that first exhaust port is positioned higher than the surface of the substrate.

Takagi et al teach a plasma processing method including a processing chamber 1 where the substrate is movable up/down during etching and cleaning operations. Takagi et al further teach that during dry processing, the distance between the shower head 7 and the lower electrode 2 is made to differ between the film forming operation and the cleaning operation and more specifically, during the cleaning operation, the distance is widened, that is, during processing the substrate is moved upward and during cleaning the same is downward. Takagi et al also teach that during processing the first exhaust port is positioned higher than the surface of the substrate, and a large amount of gas such as C.sub.2 F.sub.6 is



allowed to flow. Takagi et al further teach that during substrate processing the substrate is moved upwards such that first exhaust port 12 is positioned higher than the surface of the substrate W (e.g. Figs. 1, 2 and col. 7, line 1 to col. 8, line 32).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to position the first exhaust port at a position higher than the substrate surface as taught by Takagi et al in the apparatus of Lee et al in view of Fukuda et al, Zhao et al and Takahashi et al to provide a uniform flow of the process gas in the entire pumping channel, and also reducing the cleaning time.

Regarding Claim 28: Lee et al teach that inside of process chamber can be exhausted by the first and second exhaust ports 58, 60 when cleaning gas is introduced in the processing chamber (Lee et al – Fig. 4 and col. 5, lines 50-60).

Regarding Claim 29: Lee et al teach that the cleaning gas is SF<sub>6</sub> (a reactive gas) [col. 7, lines 35-40].

Regarding Claim 30: Fukuda et al teach a microwave is used during the cleaning process (col. 4, lines 35-40).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAKESH K. DHINGRA whose telephone number is (571)272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1792

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Rakesh K Dhingra/  
Examiner, Art Unit 1792

/K. M./  
Primary Examiner, Art Unit 1792